vol. II no. 2
October, 1942

School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

A Program Serving Youth's Vocational Needs
by Rall I. Grigsby

A Photo Enlarger
by H. C. Rose

Training Welders in Wyoming
by John Walker

Stimulate Interest in Orthographic Projection
by A. J. Badger

Tested Projects ● Instructional Resources ● News from Industry
Morning Mail ● Washington Letter

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School Shop

FOR INDUSTRIAL ARTS & VOCATIONAL EDUCATION TEACHERS

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School Shop is published monthly, September through June, at Ann Arbor, Michigan. Manuscripts are paid for at regular space rates and should be addressed to the Editor, School Shop, Box 100, Ann Arbor, Michigan. Subscription rates to libraries and institutions, $2.00 a year; Foreign and Canadian, $3.00 a year. 25 cents a copy. Printed in the U. S. of A.

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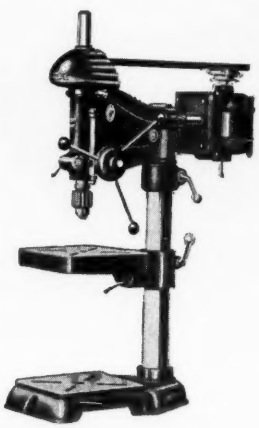

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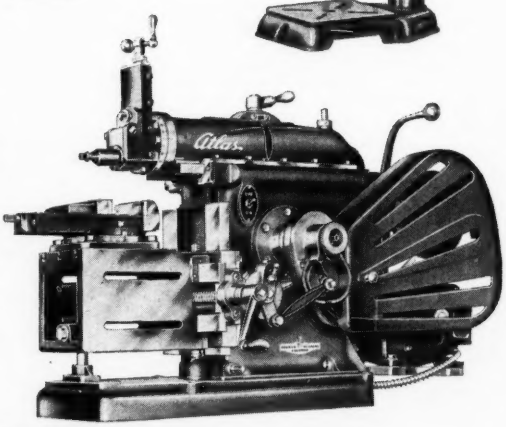

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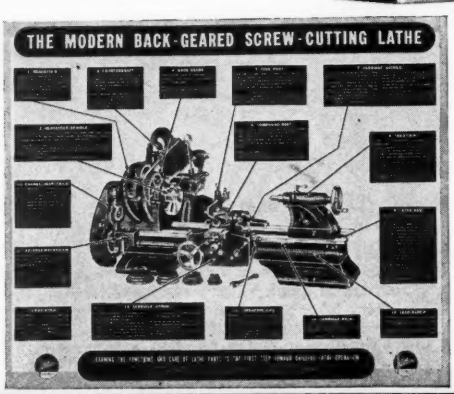

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A General Education Program Serving Youth's Vocational Needs . . .

BY *Rall I. Grigsby*

How a 14-year educational program can be made to serve the vocational needs of all youth, at the same time giving due attention to the cultural phases of life. Rall I. Grigsby is Curriculum Consultant for the U. S. Office of Education.

FOR purposes of this article let us assume that the term "general education program" means common education for the common life; a program of education generally available to all youth. Three large purposes permeate such an education—to help every individual prepare (1) to earn a livelihood; (2) to be a virtuous citizen; and (3) to be a man.

The opposition in education of the liberal and the practical, of the traditional and the modern is a false antithesis. In education as in life it is not the choice between opposite extremes which is the mark of wisdom. Rather it is a recognition of the complementary character of the elements in the whole. Of course, we wish to conserve and transmit the cultural heritage, without losing sight of its relationship to modern problems of living. Of course we wish to prepare young people both to earn a living and to live a life. We recognize that man does not live by bread alone, that the fullness of life is not neccssarily found in the consumption of the most goods. But we recognize also that without a substantial economic basis the good life is difficult of attainment. We want, therefore, an educational program generally available to all youth, which is liberal in the sense that it is well-rounded—an education for work as well as for citizenship and personal culture. A well-rounded or liberal educational program must provide in the curriculum experiences specifically designed to help young people learn to function effectively in all of their relationships.

What are the general outlines of such an educational program? Let us assume that certain structural changes in the framework of school organization have been effected along the lines of the recommendations of the Educational Policies Commission so as to provide for a junior secondary school, grades 7-10 inclusive, and a senior secondary school, grades 11-14. Let us look at the curriculum of each in turn.

The Junior Secondary School

It is proposed that approximately one-fourth of the student's total program throughout the four years of the junior secondary school be devoted to the social studies. These social studies should be focused upon an understanding of contemporary society. They should include elements from geography, history, economics, civics, and sociology. They should not be developed as separate subjects in tight little compartments but rather they should be fused and focused upon an understanding of home and family life, conservation, communication, transportation, business organization, governmental administration, the economics of production and consumption, occupational information, etc. And since the mastery of English, both as a technic of communication and as an instrument of thought, cannot be

achieved in a formal vacuum but must be related to a content of genuine importance, social studies teachers should devote considerable time to the development of the language arts in connection with the social studies program itself.

Approximately one-fourth of the student's total program throughout the four years of the junior secondary school should be devoted to the student's personal cultural development. In this segment of the student's program opportunity would be provided for a sequence of exploratory experiences in literature, language, and the fine arts, in mathematics and the natural sciences, in health and physical education and in the development of recreatory interests and skills.

Approximately one-half of the student's time throughout the four years of the junior secondary school would be devoted to the practical arts of the home, farm, shop and office. Experiences in the practical arts field would be required of all students for their prevocational or exploratory values as well as for their contribution to the development of a wide variety of practical abilities which would be of probable usefulness in life without regard to later vocational specialization.

The importance given to the practical arts in this program requires some further justification. This justification is to be found, first, in the fact that the practical and creative arts typically require neuro-muscular, rather than verbal or memoriter skills and so resist the scholastic tendency to preoccupation with bookish subject matter. The emphasis is on various types of intelligent response—the mechanical, as well as social and academic. The influence of the practical arts is in the direction of greater emphasis upon the application of knowledge and skill to the achievement of purposes.

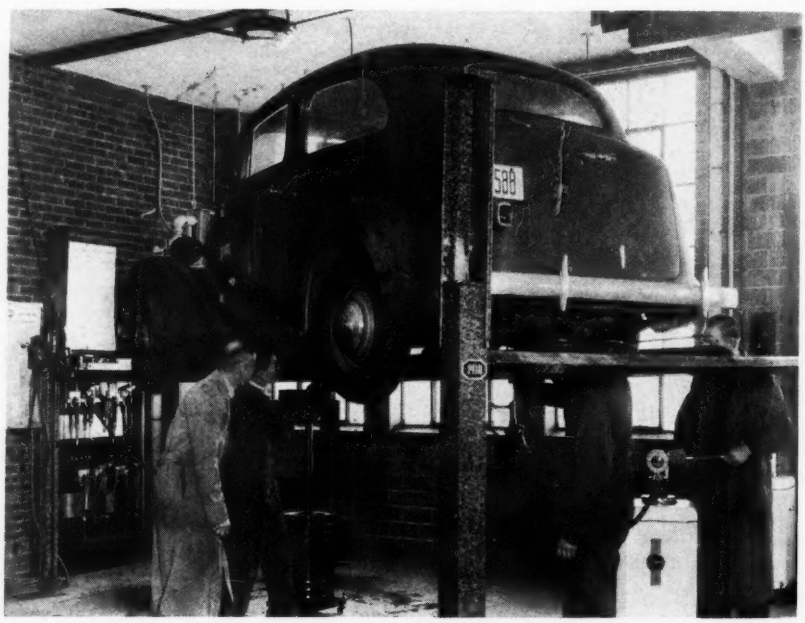
Moreover, the practical arts provide the basis for the natural integration of learning. As an example of the integration of educational activities about practical affairs, let me cite the program of vocational agriculture. In this program the learning activities of each boy are centered about and related to the farm enterprises which the boy is currently carrying forward at home. A boy's crop enterprise provides the integrating center for a study of botany and biology in connection with the propagation of plants; for a study of chemistry in connection with soil analysis; for physics in connection with farm mechanics and the handling of farm machinery; for bookkeeping, accounting, and elementary economics in connection with farm management and the disposition of his crop; and for social studies in connection with such matters as rural credit, farm cooperatives and labor problems.

The Senior Secondary School

Let us turn attention now to the senior secondary school, grades 11-14. At this level greater differentiation of courses becomes advisable upon the basis of youths' practical interests, their probable occupational futures, and their differing aptitudes. The core of the curriculum throughout the senior secondary school should be definite life-work preparation. The major objective would be to assist students to develop some initial proficiency in chosen occupational fields. Approximately one-half of the student's total program each year would be devoted to this end. During the first two years of the senior secondary school opportunity would be offered for beginning specialization in broad fields of vocational education such as home making, business, agriculture, trade and industrial occupations. This specialization might be carried still further in the last two years of the senior secondary school and include training for semi-professional and junior technical positions.

To some extent during the first two years of the senior secondary school program, but increasingly during the last two years, opportunity would be provided for cooperative part-time employment. This would require close cooperation with representatives of industry, public service, business, agriculture, and labor in connection with placement in private or on public work projects. Training on the job supplemented by related school instruction would receive credit toward graduation on the same basis as vocational preparatory instruction given entirely within school walls.

Approximately one-fourth of the student's total program each year throughout the four years of senior secondary school would be devoted to a study of contemporary social, political, and economic problems. This study would provide a more advanced and detailed investigation of special aspects of contemporary life than that provided in the junior secondary school. Its objective would be to help students attain a workable understanding of social forces and institutions, together with the ability to utilize the technics of social study and of cooperative social action to effect needed improvements in our social life.



Automobile lubrication—part of the two-year automobile trade course at North Dakota State School of Science, Wahpeton.

Approximately one-fourth of the student's total program in the senior secondary school would be devoted to personal cultural development and adjustment; that is, to the development of health and physical fitness, to development of recreatory and cultural interests and skills; and to an understanding of practical psychology.

The motivation of personal and occupational adjustment would permeate the program of both the junior and senior

(Continued on page 23)

Project of the Month:

A Photo Enlarger

BY *Homer C. Rose*

A project involving work in metal, wood, plastics, electricity, and other phases of shop work, and placing emphasis on accuracy, thoroughness, and ingenuity in devising methods of making intricate machined castings and parts. Knowledge of related chemistry and physics is also called upon. Homer C. Rose teaches at Southern Illinois Normal University, Carbondale.

SEVERAL educational objectives may be met through the construction of a photo enlarger in the school shop. It provides a challenging practical project through which to develop skills in the industrial arts such as foundry, sheet metal, machine shop, and woodwork. It may stimulate the students toward further exploration in the physical sciences, and chemistry.

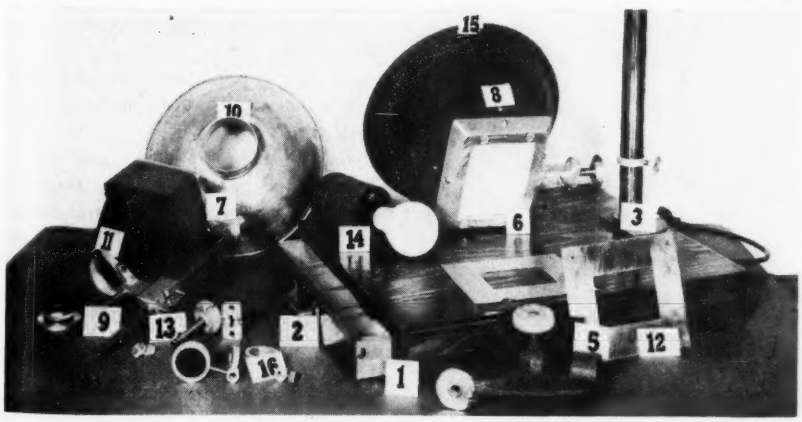
The enlarger itself is an almost indispensable piece of the photo fan's equipment. It can be of great value to the industrial arts department as a display piece, for making photographic enlargements of prints of shop work and processes, and for the teaching of photography, which in itself is an important phase of industrial arts.

Features

1. Constructed of machined castings, thus assuring accuracy and strength.
2. Smooth, accurate, and rapid focussing by means of friction wheel on vertical post.
3. Convenient, removable, dust-free negative carrier for using films without need for pressure plates of glass; facilities for using glass plates if desired.
4. Strong, even illumination.
5. Low heat at film position due to five-layer insulated glass diffusion unit.
6. Negatives up to 2¼″ x 3¼″ with 3½″ lens, and larger with alternate lens and film carrier.
7. Detachable lens plate.
8. Facilities for changing bellows extension piece.
9. Movable red screen in mount below lens.
10. Built-in drawer for print paper.
11. Ring-stops on column to facilitate making identical enlargements.
12. Adjustment for horizontal enlarging and for correction of distortion.

Cost of the projector is approximately $16.00, of which $10.00 goes for the lens, the remainder for metal, plastic, and wood parts, for the bellows, and for electrical equipment. By the use of an old camera lens and scrap metals and woods, the cost can be reduced considerably. An enlarger of similar quality would cost upwards of $35.00 if purchased from a photographic supply house.

1, Base board; 2, drawer; 3, flange and column; 5, arm; 6, body casting; 7, lower body casting; 8, transition piece; 9, lens support; 10, reflector; 11, bellows; 12, film holder; 13, focusing rod and parts; 14, cap and receptacle holder; 15, connecting ring; 16, ring stop (for column).

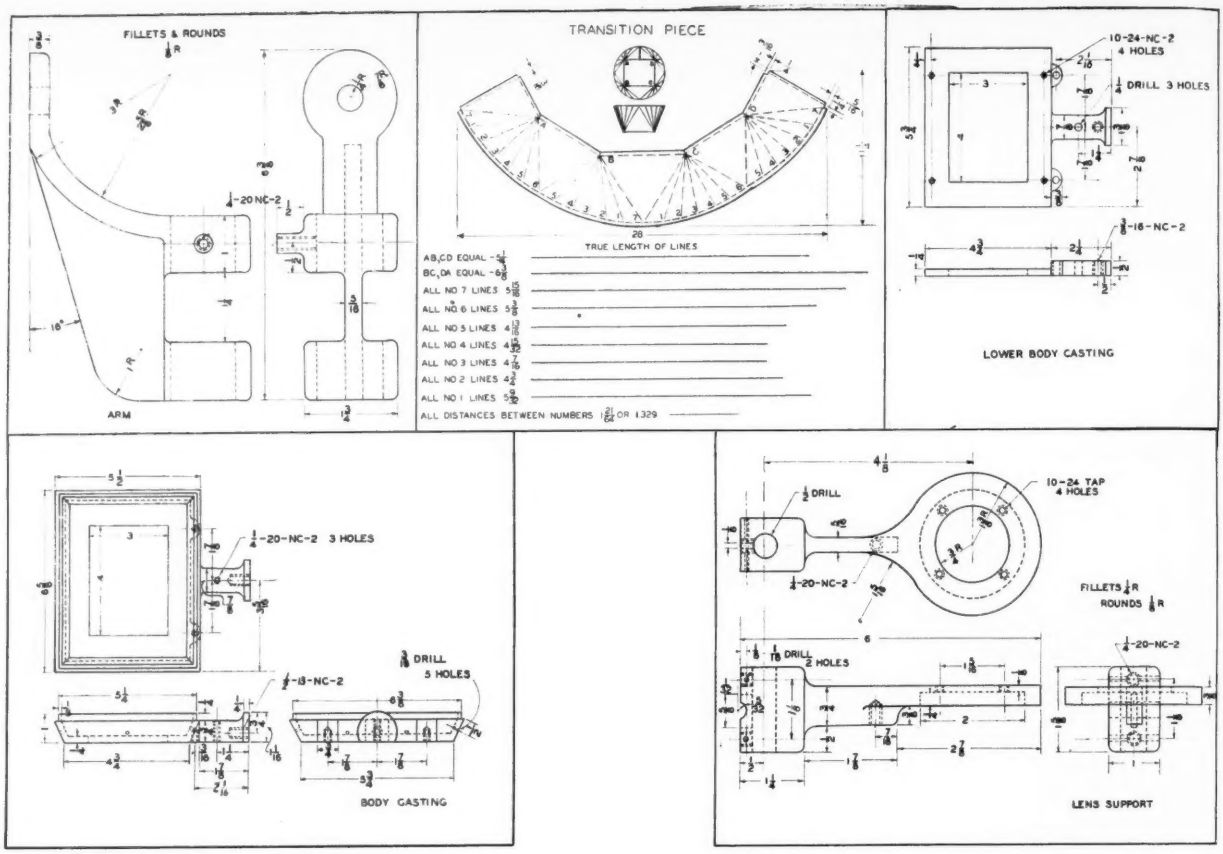


Construction Procedure

Baseboard—this part is designed to provide a large working surface for the enlarging easel and a drawer to hold enlarging papers. Fir or birch plywood is suggested.

Drawer—facilitates efficient use of sensitive paper during enlarging. May be made light-tight and fitted with a lock for storage of paper after light is turned on.

Column and flange—The column supports the lamp house and provides a means of changing distances from lens to baseboard for making different size



enlargements.

1. Cut 1" standard pipe to length.
2. Thread one end of pipe and screw firmly into flange.
3. Make two plugs for ends of pipe to facilitate holding pipe between lathe centers. (Plug at top is left in pipe and finished off.)
4. Turn column to exact size (1.25± .002) ; accuracy is essential.
5. Turn flange to size and shape while in place on column, thus insuring squareness of parts.
6. Polish column and flange. Parts may be left bright or colored with heat.

Ring stops—are used to assist in resetting the enlarger to exact height for certain sizes of pictures. May be cast, made from solid stock, or from sections of steel pipe. Should be fitted with knurled set-screws for locking to column.

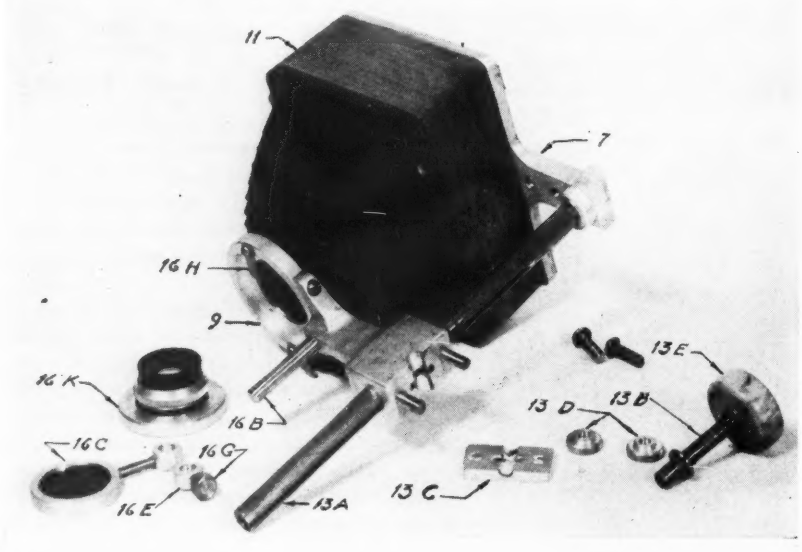
Arm—supports the enlarger proper on the column, allows for vertical adjustment, and for tilting enlarger in relation to board. Thus the enlarger may be tilted to correct distorted prints or swung to horizontal position for projecting very large enlargements on to paper mounted on the wall.

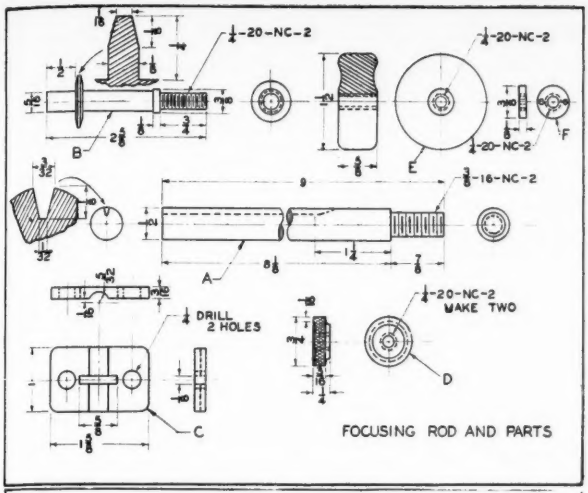
1. Make pattern, mold, and cast. Aluminum, cast iron, or gar alloy.
2. Mount in lathe chuck and bore to fit column.
3. Face extremity of arm square to bearing surfaces that fit column; drill holes; tap.
4. File exposed surfaces and finish. (Note that arm could be made of welded steel construction.)

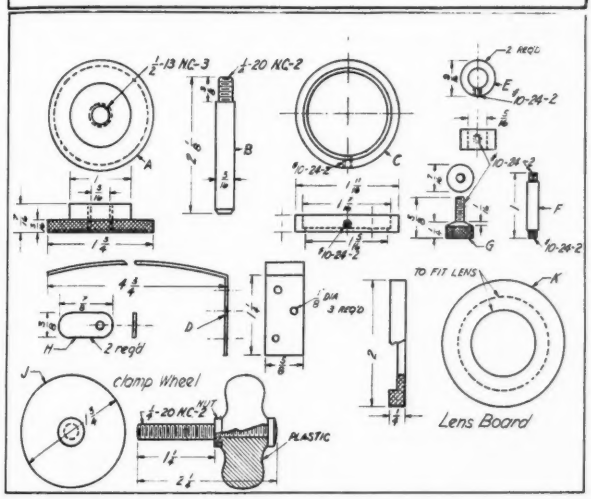
Body casting—joins the arm and the enlarger proper. It supports the lower body casting by means of three screws, one in the neck and two along the back side. The focusing rod and the sheet metal transition piece are supported by these pieces.

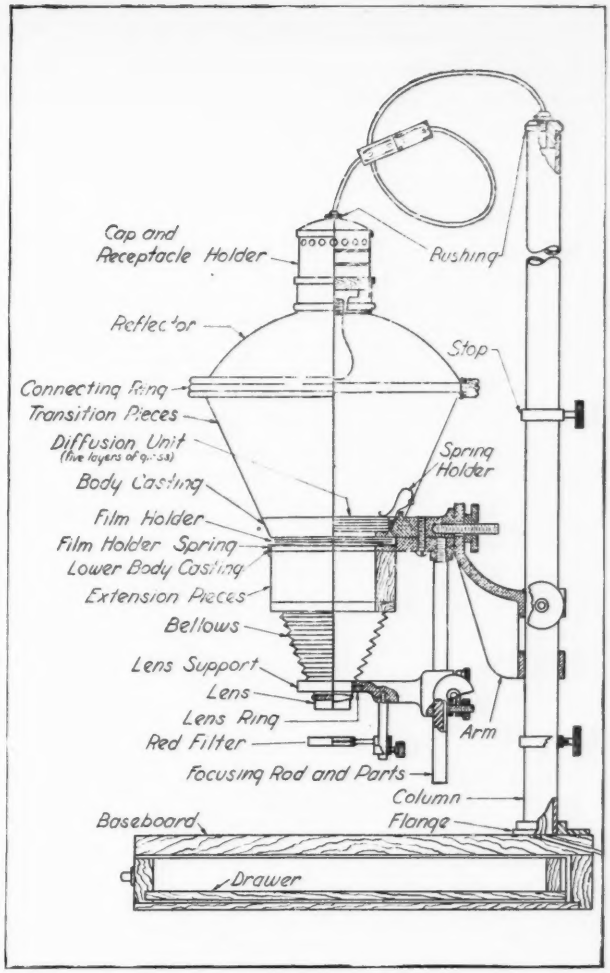
Glass diffusion unit—this unit is necessary to diffuse the light and spread it evenly over the film area. One layer of

Focusing mechanism and lens support, torn down to show construction and relation of parts.









opal or ground glass and four of clear glass are used. The layers are separated by narrow cardboard frames running around the edges of the plates, thereby preventing too much transmission of heat from lamp to film. This unit is held in place by 28-ga. spring holders that also hold the transition piece in place in the casting.

Lower body casting—fastens to the main body casting by means of three ¼-20 N.C. x 1" R.H. machine screws. The casting supports the bellows extension piece and the bellows by four 10-24 N.C. x 2⅝" stud bolts. The film holder rests on springs above the top side of the lower body casting when in use.

Transition piece—encloses the area from reflector ring to the top body piece. Twenty-eight gauge iron or brass or aluminum sheet may be used. Should be laid out to make transition from 5¼" x 6⅜" rectangle to 10½" circle in 4¼" of length.

Lens support—carries the lens, the lower end of the bellows, and the red shield. The lens end of the support is designed to facilitate changing lenses by inserting a ring fitted to the barrel of the lens. The other end provides a bearing for the focus-adjusting rod and the adjusting mechanism.

Reflector—use commercial photo flood reflector. With proper equipment and skill, may be spun from 30-ga. copper.

Bellows—should be slightly larger than largest negative to be used. Bellows from an old camera will serve. The bellows extension piece serves to extend the bellows for making small enlargements.

Film holder—two identical metal plates are needed. Two pins at the back of the plates keep them in alignment when used; these are riveted in place on one of the plates. In assembly the thumb notches on front of plates are staggered to facilitate separation of the two plates. Stainless steel, hard brass, or aluminum may be used. The surface must be kept flat and smooth to prevent marring of the film negative.

Focusing rod and parts—these parts allow for accurate adjustment and focusing. The wheel (part B) fits into the milled slot (A) and is forced into contact by pressure on plate C. Plate C, in turn, is adjusted by two knurled wheels (D) threaded on stud bolts in the lens support piece. Accuracy is essential.

Connecting ring—joins the reflector and the transition piece. The piece shown is made of wood, although the experienced sheet metal worker may prefer to design a sheet-metal strip with two wire edges.

Cap and receptacle holder—this piece holds the receptacle and bulb. It is large enough to permit removal of the bulb when necessary. The plates (one with a 1" hole and the two others with six ⅜" holes) are designed to allow for ventilation, while at the same time preventing loss of light through the top.

The Cover . . .

The front cover photograph of an industrial arts student working at metalcraft is courtesy of the U. S. Office of Education.

The illustrations on pages 8 and 9 are courtesy of Hobart Bros. Co., Troy, Ohio.

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SHOP TRAINING FOR VICTORY

A monthly department devoted to items of interest concerning war-training classes

Training Welders

IN WYOMING

BY *John Walker*

how welding, increasingly important tool of war production, is taught at the Wyoming National Defense Training School, Laramie, where John Walker is welding instructor

THIS presentation of oxy-acetylene and arc welding by the National Defense School of Laramie, Wyoming, may be classified in four general divisions: preparation; presentation; application; and testing.

Preliminary instructions for prospective students begin with the handling of oxy-acetylene welding equipment. The student is taught to handle the apparatus with confidence and with regard to safety considerations, and to recognize defects and remedy them. Each student is presented with a set of questions on oxy-acetylene welding and equipment and is allowed two weeks in which to return written answers. All oxy-acetylene welding exercises are made with ¼" steel plate and ¼"-wall-thickness pipe, in all positions.

Exercises for Oxy-Acetylene Welding

The student places a ¼" x 10" x 10" steel plate on the welding table with one end raised on a firebrick to a 15° angle. The student lights and adjusts the torch to neutral flame, carbonizing and oxidizing flames, to observe their effects on metals. Placing the plate at an angle on the welding table rather than flat prevents absorption of too much heat and requires less time to obtain a molten pool of metal. First, the student starts with a semi-circular motion without the use of a welding rod until he is able to hold a molten pool of metal without burning holes in the plate. The next step is to use a welding rod on the same type of plate in the same position until he carries a perfect, uniform ripple weld using a semicircular motion across the entire plate.

When the student has reached the necessary point of coordination between hand and brain, he is then ready to begin making fusion welds, starting with flat, vertical, and overhead positions on steel plate and pipe; he also prepares all of his specimens for welding with the cutting torch. The usual time required to complete the oxy-acetylene exercises averages from 80 to 100 hours, depending on ability.

Heavy-Duty Arc Welding

After completing the oxy-acetylene exercises, the student proceeds to training on heavy-duty arc welding. First, for maritime welding, the student starts by depositing a series of stringer beads 1" apart with 3/16" rod on a piece of scrap steel in flat position. The next step is to clean off all slag and with a ¼" electrode make a deposit over the stringer bead, using a figure-eight motion, keeping the molten pool of metal the same size, and making a uniform deposit.

After the student has mastered the technic of making a uniform deposit, he is presented with a set of questions pertaining to arc welding equipment and materials. All instruction is individual, with group demonstrations daily. All welding operations after preliminary exercises start with ¼" steel plate, one pass on each side, penetrating half-way from each side, using a 3/16" electrode. The next step is

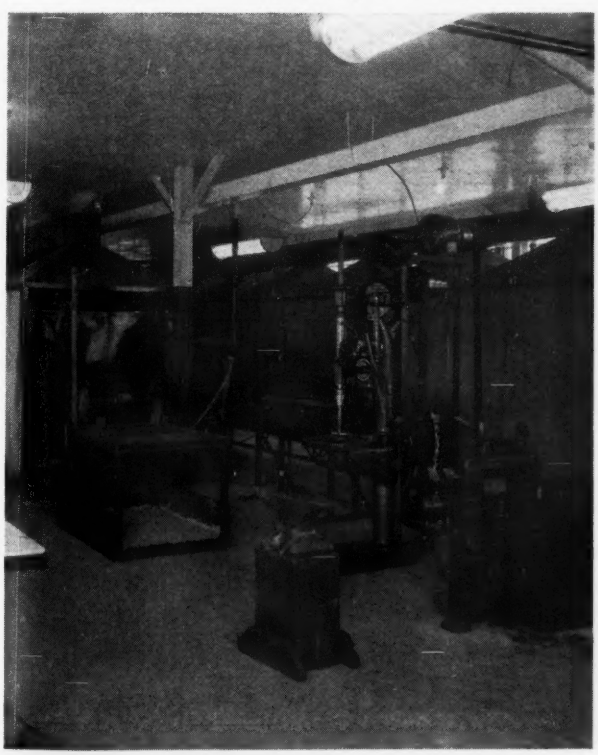
to make a three-pass fusion weld on 3/8" steel plate with a 30° bevel. Plates are spaced 5/32" apart using 3/16" rod for the first passes and a fusion weld obtained through the under side of the two plates. Successive passes are made with a 1/4" electrode using a figure-eight motion on the last pass.

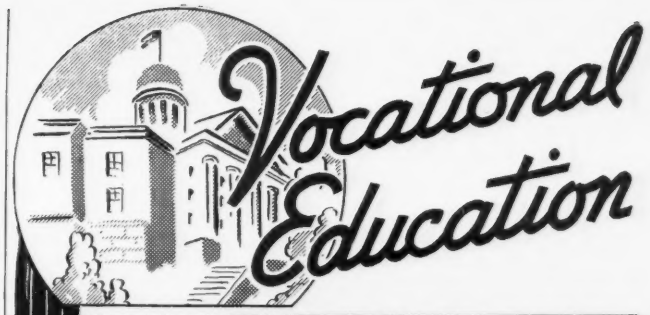
After practice welds of this type have been made up to 1/2" plate, the student is advanced to 30°-bevel 1/2" plate in a vertical up-weld using 5/32" and 3/16" electrodes. This weld is made in a series of passes using a weaving motion; it is also made in a series of stringer beads such as used for maritime welding. One of the greatest difficulties for the student when he starts this type of weld is to learn to concentrate all of his attention to the solidifying of the molten pool of metal to prevent "hang-downs." This type of weld is made with and without the back-up bar.

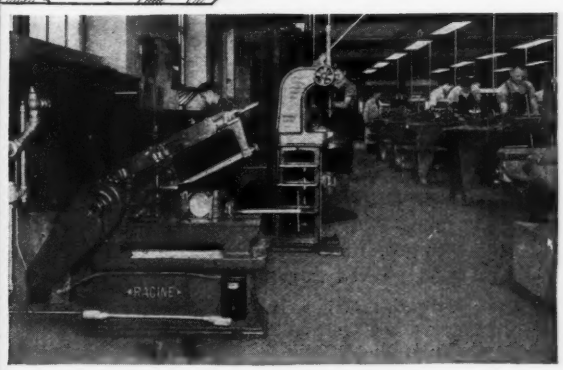
Next exercises consist of lap and fillet welds in all positions using two-pass and series types of welds. The two-pass fillet weld is never made to exceed 3/8" in size. In this weld, a 3/16" electrode is used for the first pass and the last pass is made with a 5/32" electrode without changing the machine setting. All series fillet welds are made to conform to any specified weld size. This method of instruction is also used for overhead fillets. The technic of overhead welding is to maintain a short arc and not too large a molten pool of metal, and to concentrate on the solidifying of the metal deposit as the welder advances along the seam.

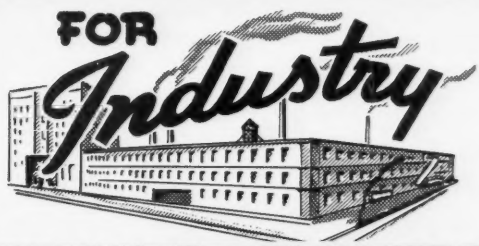
All overhead butt welds are beveled to a 30° angle on each plate and spaced the thickness of the electrode used, placing a back-up bar on all specimens. This weld is practiced with a series of passes and then is put in the bend-testing machine and bent to a 90° angle. Students with aptitude have 14 types of welds on steel plate and pipe in all positions, each of which have been done twice before they are allowed to make their qualifications test. The arc-welding course takes approximately 350 to 400 hours for completion.

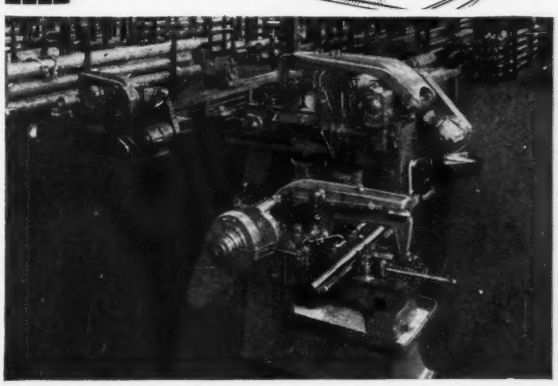
Well-equipped machine shop set-up for welding school











Behind America's fighting men stands the most powerful industrial army in the world—an army trained in modern vocational schools equipped with modern tools.

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Racine Tool & Machine Co.

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Stimulate Interest in Orthographic Projection

• *by* **A. J. BADGER**

This is a very clever teaching device which, properly utilized, should help in a difficult teaching situation. This method has the virtues of simplicity and interest stimulation. A. J. Badger teaches drafting in the Abraham Lincoln High School, Los Angeles, California.

EVERY drafting teacher has his own particular method of teaching orthographic projection. There can be few or no variations in the fundamental principles taught, but specific methods of presenting them in an interesting, challenging way may vary. The following is one such method, one step in presenting the subject. It has proved itself year after year as an invariable interest arouser and holder with classes of beginners in senior high school. Stimulating and holding interest as it does, it has proved valuable in "putting over" this subject. Its use demands working with a class as a group rather than as individuals.

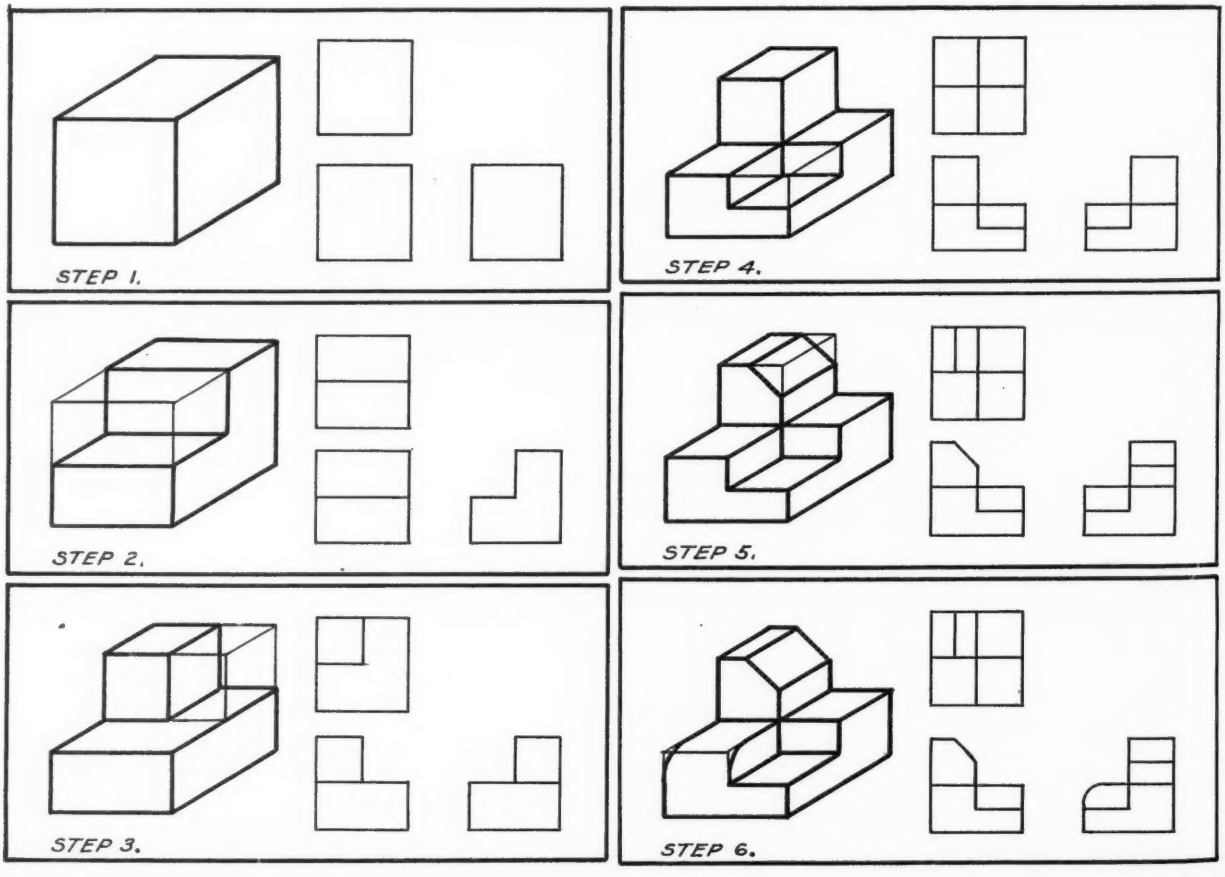
After the customary discussion and explanation of the principles involved in projection drawing, illustrated with the inevitable box with transparent sides; after a few preliminary demonstrations of projection views of simple blocks are drawn on the blackboard, and a fair grasp of the subject seems to to be evidenced by the class, the specific step which is the subject of this discussion is begun.

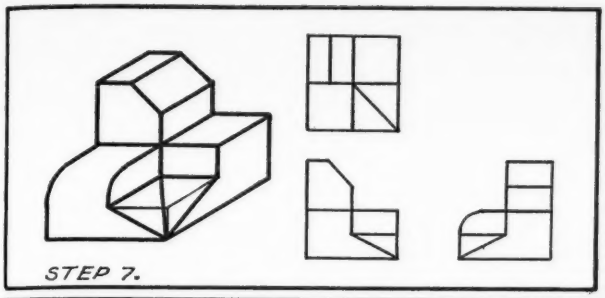
A large oblique drawing of a cube is drawn on the blackboard by the instructor, freehand. See Step 1. This should be quite sizeable since many alterations are to be made in it as the work progresses. A member of the class is then called on to draw the three conventional views (top, front, and right side) on the board beside the oblique cube, as indicated in Step 1, freehand. The instructor then changes the oblique cube as shown in Step 2. Another member of the class is called on to make whatever alterations are necessary in the first boy's projection drawings of the original cube, so that the revised views will match the revision in the oblique drawing. And so on, step by step, additional changes are made in the oblique view followed by changes in the projection views to match those changes.

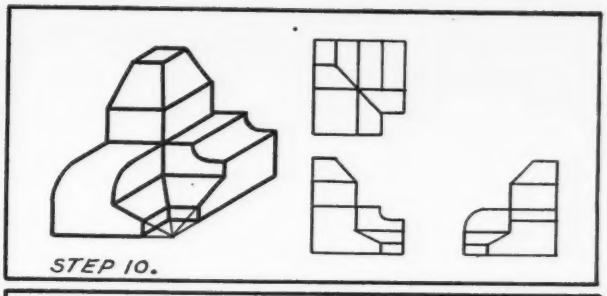
Starting with a very simple problem, the project progresses by individual steps, not always difficult in themselves, but finally, in their total, combining to present a problem which would have been unthinkably difficult to start out with. The various steps provide a variety of projection problems with lines indicating visible and hidden straight edges, curved edges, intersecting planes and foreshortened edges, all of which are explained as they arise.

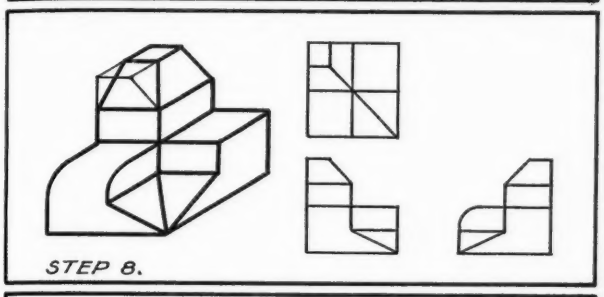
The success of this step in presenting the subject of projection comes in the keen, genuine interest it always arouses in the class as various individuals, in rotation, attempt to alter the projection views to conform to the variations in the oblique shape as drawn by the instructor. The project becomes a puzzle which challenges solution and stimulates riv-

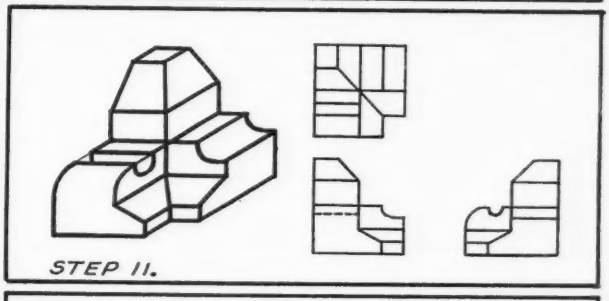
(Continued on page 14)

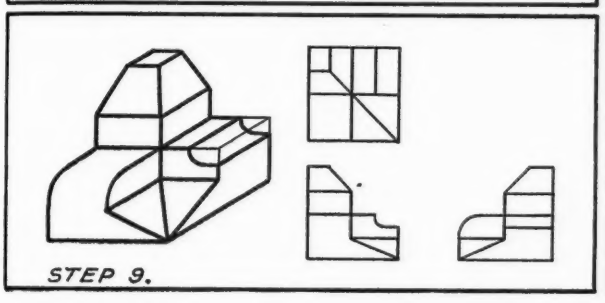


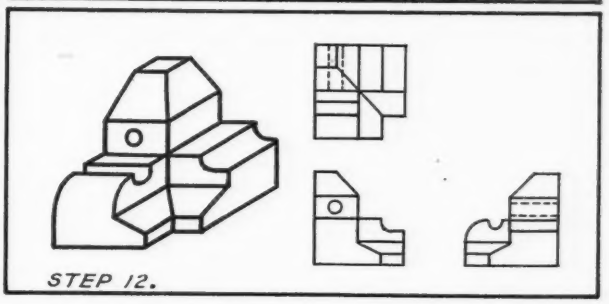












Selected Textbooks *for* INDUSTRIAL ARTS

PLASTICS—*Problems and Processes*

By Mansperger and Pepper. This is a complete revision of a popular book in a rapidly changing field. In order to bring the material thoroughly up-to-date there is added emphasis on design. **352 pages, cloth, $3.00.**

EXPLORING THE GRAPHIC ARTS

By Marinaccio and Osburn. A study of methods and necessary materials, with procedures for laboratory experiences. Covers a broad yet comprehensive orientation of graphic arts history, processes, occupations, and industries. **288 pages, cloth, $2.50.**

HOUSEHOLD MECHANICS

Industrial Arts for the General Shop,

By Bedell and Gardner. Contains 101 practical jobs which introduce the pupil to industrial arts through his desire to be useful about the home. Tests available **(5 cents per form). 134 pages, cloth, $1.34.**

WOODWORKING THROUGH VISUAL INSTRUCTION

By Sowers. Material gives in visual instruction form a graded course of construction in Woodworking for junior high school grades. **71 pages, 25 projects, cloth, $1.50.**

PLANNING BOOK FOR INDUSTRIAL ARTS

By Baysinger and Silvius. A revised edition containing a complete plan for student personnel organization. Adaptable to any school shop situation. **64 pages, paper bound, $.30.**

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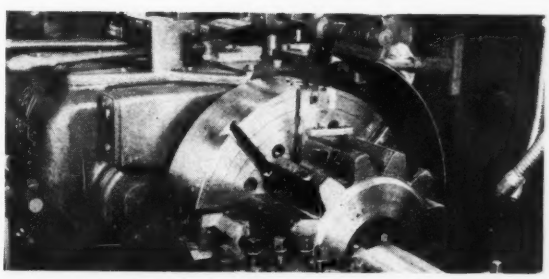

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Shop Teachers' Service

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1 Lathe Practice Wall Charts. Atlas Press Co., 1836 N. Pitcher St., Kalamazoo, Mich.

Five charts on metal-lathe practice. Subjects: **Lathe Cutting Tools** (16¼" x 21"); **Thread Forms and Formulas** (16¼" x 21"); **60° V-Type Thread Dimensions** (16¼" x 21"); **Decimal Equivalents** (16¼" x 21"); and **The Modern Backgeared Screw-cutting Lathe** (31½" x 25½"). Blue print style on durable ledger paper. Per set of five, 25 cents, coin or stamps.

2 Efficient, Safe, Skin Cleanser. Sugar Beet Products Co., Saginaw, Michigan.

Formula SBS-11 is the efficient, safe, all-vegetable hand cleanser for use in shops where students must remove grease and dirt from their hands many times during the day. For **free trial supply,** include the number of students in your classes on the coupon and mail it today.

3 New Project Books. Delta Manufacturing Co., Milwaukee, Wis.

Nine new project books just published by **Delta Manufacturing Co.,** one book each on the following: **Lamps, Chairs, Tables, Furniture Designs, Garden Furniture, Small Furniture Designs, One-Evening Projects, Novelties,** and **Toys and Games.** Send for complete information concerning this low-cost series of shop projects.

4 Wall Cards on Hand Tools. Stanley Tools, New Britain, Conn.

The **Stanley** Wall Cards, 16 in all, provide easy to understand information on the correct use and care of the common woodworking and some metalworking tools. Each Card is 14" x 18", printed both sides, lacquered for easy cleaning, provided with hooks for hanging. Many illustrations, few words. Send for a set—only $1.50 postpaid, anywhere in U.S.A.

5 Shop Textbooks. McCormick-Mathers Publishing Company, Wichita, Kan.

Textbooks on drafting, hand woodworking, machine woodworking, modern woodworking projects, metalworking and electricity are described in the **McCormick-Mathers Publishing Company's** price catalog. No charge.

6 Racine Metalcutting Saws. Racine Tool & Machine Co., Racine, Wisconsin.

Send for the **Racine** catalog showing the complete **Racine** line of metalcutting power saws from 6" x 6" to 14" x 20"—many designed especially for school and general shop use. **Racine** saws are in use everywhere in industry and throughout all branches of the armed services.

7 Shop Mathematics at Work; Blueprint Reading at Work. Silver Burdett Co., 45 E. 17th St., New York, N. Y.

Two new workbooks on fundamental shop skills. Simple, accurate, and clearly written. Advertisement on third cover of this issue. Write for complete information.

BE SURE that all information is supplied as requested on the coupon at the right.

8 Portable Electric Tools Catalog. Skilsaw, Inc., 5029A Elston Ave., Chicago, Ill.

Catalog 43, **Tools for Defense of America,** contains on-the-job photos in Defense plants, explains specific applications, describes the complete line of famous **Skilsaw Tools.** Helpful in training the men and boys who will use these tools in industry.

9 War-Training and Aviation Texts. McGraw-Hill Book Co., 330 W. 42nd St., New York, N.Y.

Two helpful booklets, **Textbooks for Training in War Industries and the Armed Forces** and **Aviation Zooms Ahead,** constitute an up-to-the-minute descriptive list of 217 titles, 135 of which are brand-new 1941 and 1942 publications. The latter book describes titles in aviation. Both are free to teachers.

10 "Keep Your Lathe Clean" Manual. South Bend Lathe Works, South Bend, Ind.

Send for the new South Bend bulletin H-1, **"Keep Your Lathe Clean."** Sixteen pages, illustrated, on the care of the engine lathe. No charge. Ask also for the new South Bend Catalog 100B describing the complete line of South Bend engine and turret lathes.

11 Teaching Shopwork for War Production Industries. McKnight & McKnight, Bloomington, Ill.

"How to Teach Shopwork for War Production Industries," by Paul T. McHenry. List 25c. A timely help for shop teachers responsible for training programs in line with the war effort. Sent **free** with approval orders for

Methods of Measurement, Cornetet.
Engine Lathe Operations, Whipple & Baudek.

12 Small Turret Lathe. Logan Engineering Co., Chicago, Ill.

Latest bulletin describes the new **Logan** ⅝" Hand Screw Machine (No. 830). Ball-bearing headstock, precision ground bed, adjustable cross-slide and turret-slide gibs—accurately and rigidly built for continuous production. Write for specifications and prices.

13 Pocket Carbide Tool Manual. McKenna Metals Co., Latrobe, Pennsylvania.

Profusely illustrated with photos and diagrams, this small, 48-page manual covers the use of **Kennametal** carbide tools for machine shop use. Included is information on selection of the proper tool, designing, using, brazing, and grinding the tools. Also listed are specifications for standard **Kennametal** tool blanks.

14 Lathe Operation Manual. Sheldon Machine Co., Chicago, Ill.

A handy, concise, complete manual on the operation of the engine lathe, published by the makers of the **Sheldon** lathe. Covers straight turning, thread cutting, special operations. Also information on setting up and caring for the lathe; and related information and tables. Price: 50c; special reduction for quantity orders.

15 Woodworking, Other Industrial Education Texts. Manual Arts Press, Peoria, Ill.

Newest beginning wood-shop book is **Woodworking Workbook,** which maintains the desired balance between hand, head, and paper work—inexpensive, only 42 cents in quantities. Write for approval copy, and for **complete catalog** and circulars on this book and others for industrial arts, crafts, projects, and teaching aids.

NOTE: A few of these items require that money be sent with the coupon. PLEASE do not forget to enclose the required amount—check, money order, stamps, or coin.

16 Turret Lathe Operator's Manual. Warner & Swasey Co., Cleveland, Ohio.

Turret Lathe Operator's Manual, covers all phases of turret lathe work—explains metal-turning methods, short-cuts, etc. Contains tables on feeds, speeds, tool angles, threads. 240 pages, illustrated. $1.00 per copy.

17 Hand Tool Catalog. Plomb Tool Co., Los Angeles, Calif.

Latest **Plomb catalog**—1942 edition, No. 19—lists complete **Plomb** line of over 1200 kinds and sizes of high quality forged hand tools including sets, kits, and boxes. Lithographed in color and profusely illustrated. Ideal for instructors and students in mechanical lines. Mailed to SCHOOL SHOP readers without obligation, upon request.

18 Engine Lathe Conversion Attachments. Jefferson Machine Tool Co., Cincinnati, Ohio.

Convert your engine lathe into a turret lathe. Illustrated circular shows how **Jefferson** turret attachments convert any engine lathe for the training of turret lathe operators. Also free literature on adjustable pull-feed, **Jefferson** precision milling machine, miller attachments, dividing heads, overhead swing-frame grinders, endless belt-sander, gyratory foundry riddles.

19 Vocational and Defense Training Books. American Technical Society, Drexel at 58th, Chicago.

Catalog describing practical new textbooks, workbooks, and reference books, especially prepared for **defense, vocational, and industrial arts classes.** Covers machine trades, building trades, aviation, shop mathematics, welding, ship-building, and other fields. No charge.

20 Vocational and Technical Texts. John Wiley & Sons, Inc., 440 Fourth Ave., New York, N.Y.

Fifty-six catalog pages of books of direct interest to teachers of vocational subjects. Recent books include: **Reading Engineering Drawings** by Bush; **Aircraft Engine Maintenance** by Suddeth; **Essential Mathematics for Skilled Workers,** by Keal and Leonard; **Strength of**

Materials, by Merriman and Hawkins. Send for approval copies.

21 Student Machinists Handbook. L. S. Starrett Co., Athol, Mass.

The new **Starrett Book for Student Machinists** will prove an invaluable instruction manual and ready-reference handbook. Approved by leading vocational training experts and shop class supervisors in nationally-known industrial plants. Written in clear, simple shop language, profusely illustrated and completely indexed. 184 pages, 200 diagrams and illustrations, 30 valuable reference tables. Price only 75c.

22 Lumber, Industrial Arts, & Fine Arts Catalog. Brodhead-Garrett Co., Inc., Cleveland, Ohio.

Our annual edition, just off the press, available free of charge. We specialize in **Soft Texture** lumber for industrial arts and vocational education use. Also a variety of items such as paints, varnishes, drafting supplies, carpenter tools, leathercraft, machine-shop tools and supplies, etc.

Do not delay in mailing the coupon—send it today and receive these helpful instructional aids as soon as possible—you need them in your teaching!

23 Gluing Helps. Casein Co. of America, 350 Madison Avenue, New York, N. Y.

Casco Gluing Guide—33 pages, illustrated. History, manufacture, and detailed directions for use of **Casco** (casein) and **Cascamite** (resin) glues in school and home. No charge.

Project Folders—Pictures, descriptions of 36 furniture and water sports projects made from plans obtained with **Casco** and **Cascamite** package coupons. No charge.

24 Ohm's Law Calculator. Ohmite Manufacturing Co., Chicago, Ill.

Helps figure ohms, watts, volts, amperes—faster, easier. **Solves any Ohm's law problem with one setting of the slide.** Requires no slide-rule knowledge; all values are direct reading. Scales on two sides cover range of currents, resistances, wattages, and voltages commonly used in electrical work. Only 10c each to cover handling cost; special quantity price for students.

25 Visual Aid Circular. Comet Model Airplane & Supply Co., 129 W. 29th St., Chicago, Ill.

Free 4-page circular lists and describes new Comet **wind-tunnel** for classroom aeronautics teaching, and other **visual aids** for air-age aviation education. Also the **Air-O-Trainer**—aircraft control model demonstrating operation of controls of full scale plane. Lists also model plane kits. No charge.

26 New Universal Precision Indexing Head. Cleveland Tool Engineering Co., Cleveland, Ohio.

Will handle all straight-shank tools to and including 1"; all Brown & Sharpe to and including No. 9; all Morse to and including No. 4. Graduated 360 degrees in 3 planes; 60 index divisions; vernier between index points. Supplied with one collet. Send for information, no charge.

27 How To Build Model Airplanes. X-acto Crescent Products Co., New York, N. Y.

A practical brochure slanted to the need and understanding of beginners in the model airplane field. Practical instructions with illustrations on how to build scale-model war planes required by the Army and Navy for spotting, identification, range finding, etc. No charge.

28 Rotary Wood Planer. H. J. Berry Mfg. Co., 2297 Scott St., Detroit, Mich.

Free circular describing uses of the **Berry Safety Rotary Planer** in woodworking. Shows how planer operates when installed on a drill press. Tells how to plane knots and end-grains without gouging—and how to use the tool for inlaid work.

29 Movies To Help Win The War. Brandon Films, Inc., New York, N.Y.

New **catalog** on Brandon's documentary, vocational, and aircraft films, 16 mm. sound and silent. Films on the protective services, civilian defense, production for victory, etc. Catalog lists rental rates, special bulk-booking low rates, and sales prices.

30 Industrial Education Textbooks. International Textbook Co., Scranton, Pa.

International Textbook Co. has recently published a **General Catalog** listing the titles of their **High School, College** and **International Library of Technology** volumes. New books this fall are: **Exploring the Graphic Arts, Plastics—Problems and Processes,** and the **Student's School Shop Planning Book.** Send for the catalog, no charges.

31 MoToR's Factory Shop Manual. MoToR Magazine, Book Dept., 572 Madison Ave., New York, N. Y.

This big 600-page manual illustrates and describes in step-by-step procedure how to repair and overhaul every model passenger automobile built since 1935, including 1942's. Most complete ever published—contains official shop procedure manuals prepared by the manufacturers' own engineers. Used by technical schools and the U. S. Army. Quick-reference index, waterproof binding. Price, to Oct. 16: $4.00; new edition after Oct. 16: $5.00. Discounts to teachers.

32 Education Digest, Free Copy. The Education Digest, Ann Arbor, Michigan.

The **Education Digest** contains interesting, vital articles on the educational problems of a nation at war—keeps you up-to-date and informed on latest educational trends and pronouncements. A **must** for the busy shop teacher, with limited time for reading. Send for free sample copy.

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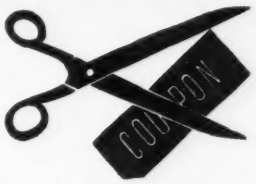

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. . . news from INDUSTRY

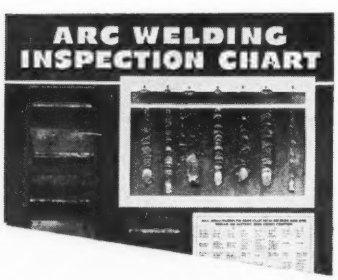
For items listed in this column, readers may address the firm named or write to News from Industry Dept., SCHOOL SHOP, Box 100, Ann Arbor, Michigan.

Armstrong Brothers Co. Wins Coveted Army-Navy 'E'

September 15 saw the presentation of the Army-Navy "E" for excellence in production of war materials to the Armstrong Brothers Tool Co., Chicago. Presentation was made by Army and Navy officials, who awarded the coveted "E" flag to the employees and management of the company of which Horace Armstrong is president.

Comet Company Develops New Classroom Wind Tunnel

A wind tunnel for classroom use has been developed by Comet Model Airplane & Supply Co., Chicago. The tunnel embodies many of the features of the full-scale tunnel, including a honeycomb to straighten out airflow. Windows in the sides enable students to view the action within. Any 16" electric fan will provide sufficient wind to operate the tunnel. The instrument is designed to read directly in units of lift and drag, on dials in front of the tunnel. Supplied with the tunnel, which comes knocked down for assembly, are a number of test models for experimental demonstration. Further information may be had from the company at 129 W. 29th St., Chicago, Ill., or from SCHOOL SHOP.



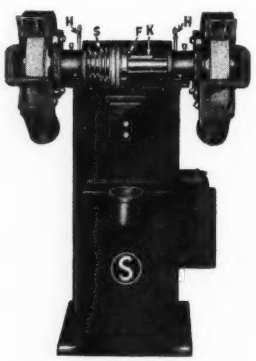
Welding Inspection Chart Issued by Lincoln

Lincoln Electric Co., of Cleveland, Ohio, has just published a chart on arc welding inspection of interest to welding instructors in evaluating the quality of work done by their students. The several types of welds are pictured as done normally with proper current, speed, and voltage, and as done with these factors improperly set. Size, shape, and appearance of the bead are shown, as well as overlap, undercut, and craters.

Also included are tables showing burnoff of the electrode, penetration of fusion, sound of the arc, etc. The chart is free to instructors, who may write SCHOOL SHOP or the Lincoln Electric Co., 12818 Coit Rd., Cleveland, Ohio.

All South Bend Lathes Described in Catalog

The complete line of South Bend Lathes is described in a comprehensive catalog just issued by South Bend Lathe Works, South Bend, Ind. Included are all South Bend toolroom, quick-change-gear, plain change gear, and turret lathes, and attachments, complete with specifications and operating information about each. Copies may be had without charge by writing SCHOOL SHOP or South Bend Lathe Works, Dept. S5, South Bend, Ind.



Standard Develops New Multi-Speed Grinder

Featuring economy of operation, a new Multi-Speed Grinder has been added to the line of Standard Electrical Tool Co., Cincinnati, Ohio. This new grinder, of pedestal construction, offers several speeds of operation through its multiple V-belt drive. It also has the advantage of being able to use wheel stubs from larger machines which were formerly discarded—thus providing additional wheel economy. As shown in the illustration, the grinder permits wear of a 12-inch wheel to 5-inch diameter maintaining the peripheral speed throughout the life of the wheel. Complete information may be had by addressing the company or SCHOOL SHOP.

Chicago Wheel Offers 'Mounted Wheel' Chart

A wall chart showing all types and sizes of mounted abrasive wheels for use with rotary grinding tools has been offered to vocational teachers for their classrooms by Chicago Wheel and Mfg. Co., Chicago. The chart gives the dimensions of each wheel, and pictures it in actual size. Copies may be had from the company or from SCHOOL SHOP.

Orthographic Projection

(Continued from page 10)

alry and desire to solve when others are seen to be failing. Its use never fails to help in really teaching this subject. Try it!

Notes on the drawings:

1. In each instance, the division of parts of block in oblique view, halve the part being altered. This simplifies the drawing.

2. In the oblique drawing, light lines are left to indicate the change from previous step. They are not left on in the blackboard work.

3. The shape alterations are purely arbitrary. Others may be devised. Those shown illustrate the idea.

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instructional resources

Inquiries concerning materials described in these columns may be addressed to SCHOOL SHOP, Box 100, Ann Arbor, Mich., and will be passed on to the proper firm or person.

Aeronautics in the Industrial Arts Program. Wilber and Neuthardt. New York: The Macmillan Co., 1942. Pp. xiii+252. $0.92.

This is the first in Macmillan's new "Air-Age Education Series." It is mainly a handbook for students and teachers covering the entire field of aviation as it relates to the industrial arts curriculum in both elementary and secondary schools. Much space is devoted to organization and content of courses, suggested teaching devices—in general, an outline of how the growing and important subject of aviation can be integrated into and taught effectively in industrial arts classes. Helpful bibliographies, sources of supply, etc., are included; illustrations; index.

The entire series, which will include books on aviation fitting into all phases of school instruction, is being prepared with the cooperation of the Civil Aeronautics Administration and under the sponsorship of the Institute of Aeronautical Sciences. Gordon O. Wilber is acting director of the industrial arts department at Oswego, N. Y., State Teachers College. Emerson E. Neuthardt teaches in the industrial arts department of Bethlehem High School, Delmar, N. Y.

How To Work with Tools and Wood. New Britain, Conn.: The Stanley Works, 1942. Pp. 188. $1.00 (quantity discount).

After going through eight printings, this popular Stanley handbook has been completely revised and issued in a new edition. The book includes elemental instruction on the use of hand tools and illustrates these uses by projects such as a workbench, bookends, etc. The care of tools is discussed, as well as construction of the common joints, use of working drawings, and finishing.

Reading Engineering Drawings. Bush. New York: John Wiley & Sons, Inc., 1942. Pp. ix+60. $2.00.

A simply-written manual of blueprint reading—chapters on lines, shapes, section views, words and symbols, and a section on reading manufacturer's engineering drawings. For use with the book are a number of blueprints in an envelope bound integrally with the book. Appendix of tables; index.

George F. Bush is assistant professor of graphics at Princeton University.

Metallurgy. Johnson. Chicago: American Technical Society, 1942. Pp. vii+262.

An introductory textbook on the study of metallurgy, newly revised and enlarged. Attempts to present in a simple way some of the basic knowledge concerning the manufacture and behavior of the many metals and alloys in use today. Illustrations; quiz questions; tables and charts; index; bibliography.

Carl G. Johnson is assistant professor of mechanical engineering at Worcester Polytechnic Institute, and member of the American Society for metals and of the American Welding Society.

Machine Shop Practice. Hagberg, Corrington, and Biehler. New York: Harper and Brothers, 1942. Pp. xvi+311. $2.50.

This text on machine-shop practice contains instructional job units on lathes, millers, and other machine tools. In addition, there is a unit of suggested procedures for the instructor, one on measuring instruments, and one on bench work. With each job are working drawings. Tables; index; illustrations.

Sherman B. Hagberg, M. S. Corrington, and R. M. Biehler are all on the staff of Rochester (N. Y.) Athenaeum and Mechanics Institute.

Films . . .

UNFINISHED RAINBOWS. Chicago: Wilding Picture Production, Inc. 3½ reels; 16 or 35 mm.; sound.

A 3½-reel picture in technicolor giving a biography of the aluminum industry from the use of aluminum as tableware by Napoleon III to the discovery by Charles Martin Hall of a practical commercial method of refining the metal. No charge except for transportation charges; address Wilding Picture Production, Inc., 1345 Argyle St., Chicago, Ill.

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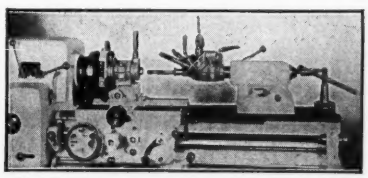

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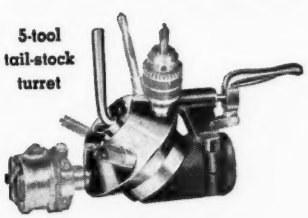
Photo shows turrets applied to 16" lathe

5-tool tail-stock turret



● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool holders which are easily inserted and rigidly held. *10 days delivery.*

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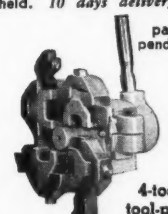

4-tool tool-post turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (above), made in 4 sizes to fit small bench lathes and lathes up to 20" swing. Also the adjustable PULL-FEED LEVER. All tools are precision made attachments which will convert any engine lathe into a production turret lathe. *10 days delivery.*

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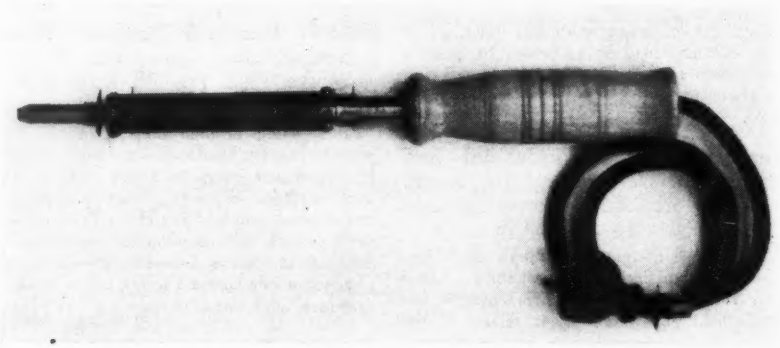
An Electric Soldering Copper



BY *Boyd M. Haag*

The strong point of this soldering copper, in addition to the opportunities it provides for teaching the elements of electricity and the use of hand and machine tools, is the heating element which is frequently a weak spot in this type of project. The author, who teaches at Langley High School, Pittsburgh, Penna., states that if the element is properly made it will last indefinitely.

FOLLOWING is the list of operations in the construction of an electric soldering copper which has been developed after studying several types of school-made irons:

1. Cut a piece of brass tubing, 4½" long, ¾" O. D. Used fixture casing will do.

2. Turn a brass (or iron) washer, 3/16" thick, outside diameter, to fit the tubing snugly. Drill a ⅜" hole in center of washer. This washer is for the tip end of the soldering copper.

3. Turn a piece of cold rolled steel to ½" D. for a distance of 3". On one end turn a shoulder 3/16" thick and 11/16" D. This shoulder should fit the tubing snugly. The other end fits into the wooden handle. Drill a hole straight through this piece 5/16" D.

4. Fit this piece into one end of the brass tubing and the washer made in (2) above, in the other end. At a distance of 3/32" from the end, mark off the circumference of the tubing in three equal parts on both ends. At these points, center punch, drill, and tap for a 6-32-inch brass machine screw.

5. Cut a piece of ⅜" D. round copper, 5½" long. (Some types of trolley wire will do.) Shape one end of the copper for the tip and slip on the washer made in (2) above to a distance of 1½" from the tip end.

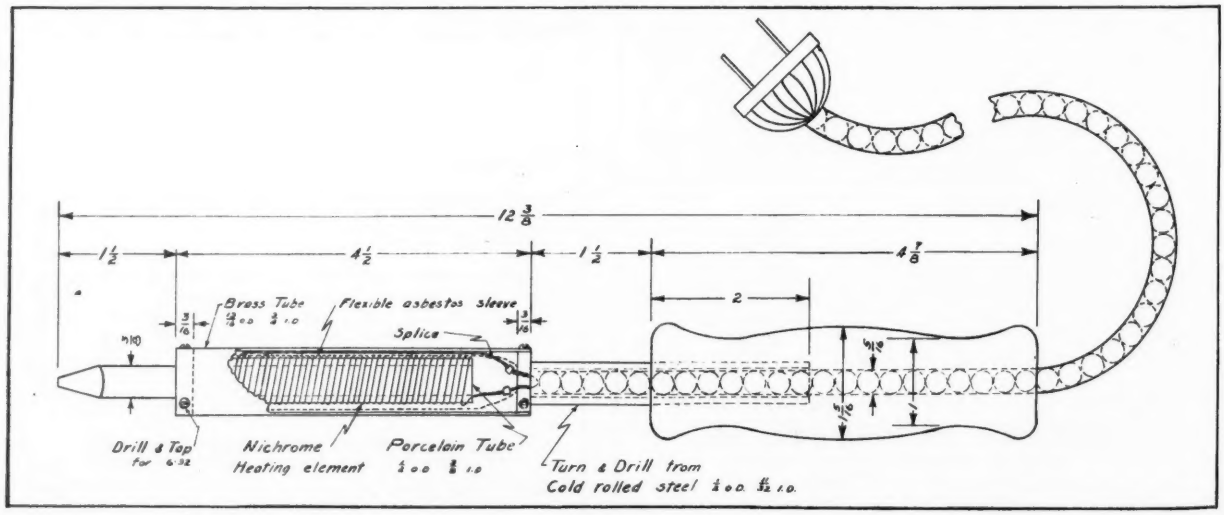
6. Secure a straight side porcelain tube, ⅜" I.D., ½" O.D., 3" long. (The writer will be glad to furnish additional information to anyone having difficulty in securing any of the parts for this project.) If the resistance per foot of the nichrome wire to be used for a heating element is known, an element of most any desired wattage may be wound on the tube, the total length of the wire being computed by the formula: $\text{watts} = \frac{(\text{volts})^2}{\text{ohms}}$.

This size soldering copper should not be designed to use more than 115 watts and No. 30 nichrome resistance wire will be found suitable. Wind the tube with the wire on a lathe mandrel using a screw feed fine enough to insure that each turn will have a slight air space insulation and of course not touch the next turn of wire.

7. After the element is wound, give it a coat of insulating cement.

8. Remove finished element from mandrel and attach leads of bare magnet wire. Cover the leads with asbestos flexible sleeving.

9. Place the heating element over the copper rod and assemble the project. The handle should be turned from hardwood, with a ½" D. hole drilled in one end for a distance of 3" for a drive fit on the soldering copper.



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BASKETBALL

Towel Truck

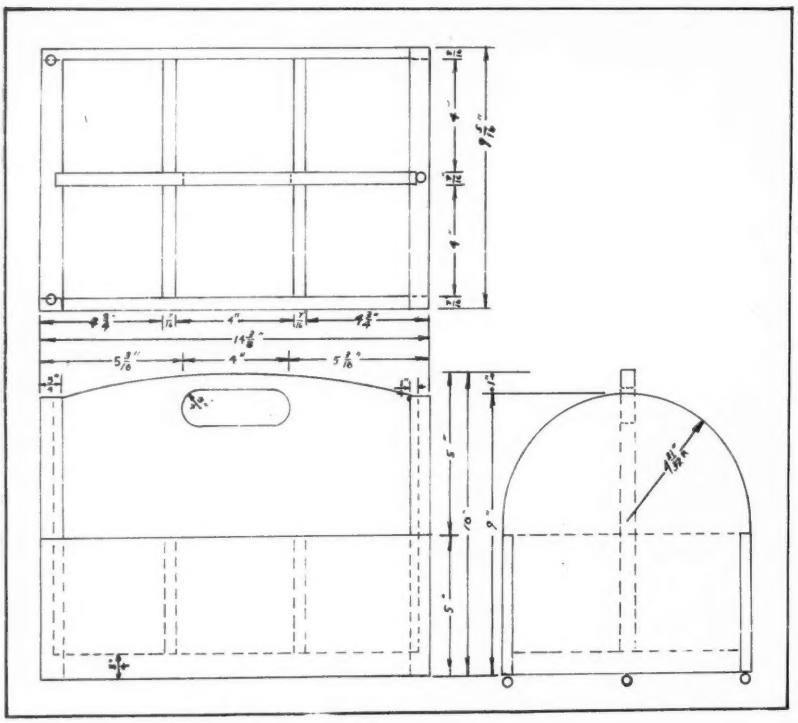
BY *Ivan W. Smith*
Head, Industrial Arts Dept., Aberdeen, S. D., Schools

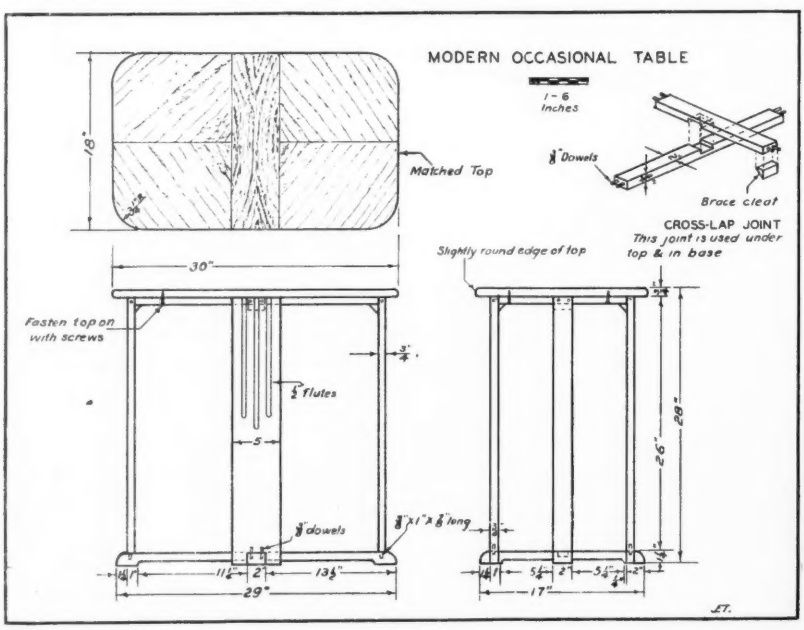
THIS basketball towel truck, built in the high-school wood shop, has been an ideal project from the standpoint of operations involved as well as for the interest aroused in its construction. Such trucks have been made for our interscholastic and intramural teams.

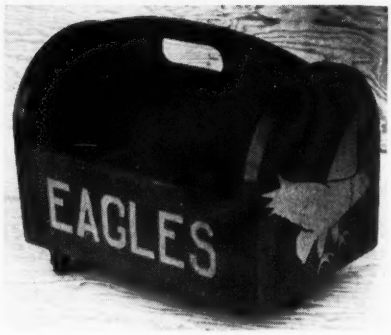
Six compartments are provided in the truck, five for towels and one for other articles such as a can of rosin. A slight shove from the sideline sends it to the boys on the floor, and the team returns it in the same manner. Note that only three casters are used; four will cause it to make a wide arc in spinning, while three enable it to travel in a straight line.

The name of the school is lettered on one side, the name of the team on the other, with the team emblem on the ends, all in school colors.

Bill of Materials:
Ends—2 pc. $\frac{3}{4}$" x $9\frac{5}{16}$" x 9", plywood.
Bottom—1 pc. $\frac{3}{4}$" x $7\frac{13}{16}$" x $12\frac{7}{8}$", plywood.







Center—1 pc. $\frac{7}{16}$" x 10" x $13\frac{3}{8}$", plywood.
Sides—2 pc. $\frac{7}{16}$" x 5" x $14\frac{3}{8}$", plywood.
Partitions—4 pc. $\frac{7}{16}$" x $4\frac{1}{4}$" x 4", plywood.

MODERN

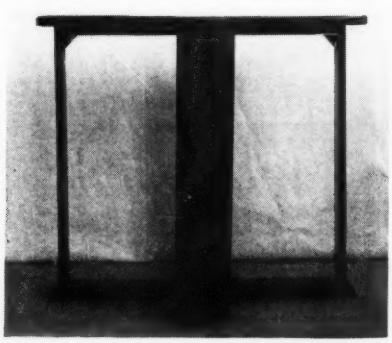
Occasional Table

BY *J. E. Tolman*
Head, Wood Shop,
Chaffey Union High School,
Ontario, California

THIS project is for students of the ninth- or tenth-grade level. The matched plywood top built up by the student gives an otherwise ordinary project a very professional appearance.

The construction of the top consists of pieces of $\frac{1}{4}$" walnut plywood glued to $\frac{1}{2}$" Oregon pine plywood. The center section, selected from a coarse slash-grained sheet, is glued on first. The other four pieces are cut from a sheet of plywood which is definitely ribbon-grained in nature. With a steel square lay out the four rectangles to be cut in such a manner that the grain crosses each piece at 45 degrees. This will cause considerable waste in cutting but the pleasing effect gained more than offsets the material lost. The pieces of plywood should be so joined that only a very fine hair line is visible at their contact. A slight chamfer or under-cut on each edge often aids in making a close fit.

In the finishing process the edge of the top must be very carefully filled and sealed in order that the built-up effect will not show.

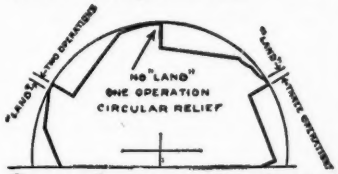


Circular Relief Grinding

WITH NO "LAND"—ONE MACHINE—ONE SETUP—ONE OPERATION . . .

This Is All Done in One Operation!

Because the tool has been ground with the circular relief exactly the same as curve of tool, outside of tool is left convex. Therefore, all metal possible has been left behind cutting edge to give maximum support and longer tool life. Degree of clearance is determined by distance tool is moved in or out against curved face of grinding wheel. Write for complete details.



Comparing conventional grind with circular relief grind.

1. Dress face of grinding wheel so it has exactly the same curve as the tool to be ground.
2. Offset tool from center of curve of wheel to give desired clearance.
3. Grind clear to cutting edge.

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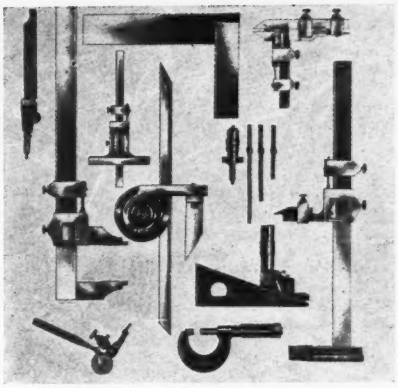

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RATTLER *Wristlets*

BY *Stan Schirmacher*

Here is an interesting and unique craft project which is particularly appropriate for the region from which the author hails. He is an industrial arts teacher at the Franklin School, Mesa, Arizona.

THIS interesting crafts project involves the three types of four-strand braiding: the "round," "square-round," and "square," as well as the "turk's head" lock knot. These lifelike rattlesnake bracelets can be made in school colors, adding to their popularity. The imitation leather lacing which is used can be purchased from any leather crafts company and is called "gimp," "craftlace," "pyrolace," "pyrostrip," "pyrocraftstrip," etc.

Bill of materials:

2½ yds. of "light colored" lacing.
2½ yds. of "dark colored" lacing.
5 inches of red or black lacing.
16 inches of No. 10 or No. 12 wire.

Construction procedure is as follows: Start "square" in the center of the two long lengths of lacing, as is shown in Fig. I. Continue "squaring" by folding lacing back (left) over in the direction it "came from," put the last strand over and under, see Fig. II. (The next layer folds back right, etc.) Continued this for about one-half inch, then place the sharpened end of the wire in the center of the "square" and continue "squaring" around it another half inch, making one inch of "rattler" on the snake's tail.

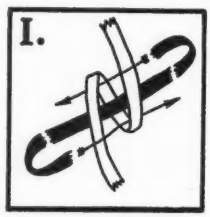
You are now ready to start four-strand round braiding, as illustrated in Fig. III. Procedure: Holding two strands in each hand, "drop" the "highest" strand (as 1A) and push it around in back (with the forefinger) into position between the two opposite strands, then hold all four between the thumb and forefingers; let the other hand drop the two strands it has been holding, take the strand in between (2A) and "*roll*" it over on top towards the side it came from. (By "rolling" is meant keeping one side of the lacing always against the wire.) Now with both hands *pull* the pairs of strands apart, tightening the braid. Repeat the procedure with 2C, 3B, left, right, etc., etc. Continue round braiding up to within one-half inch of the end of the wire.

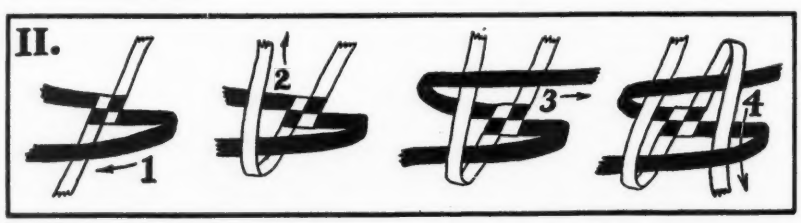
The round braiding just described, with one color to the right and the other to the left, results in a repeated diamond or checkerboard pattern. Another style can be used, the spiral pattern, which is simply obtained by braiding with one strand of each color on both sides.

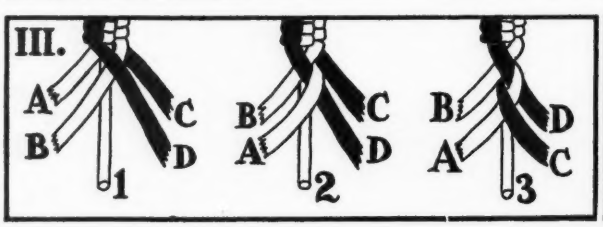
Now make a square similar to the start of the tail. (Fig. IV.) For the head the "square-round" is made. This is made somewhat like the square; but instead of folding back in *exactly* the same direction it came from, each strand is now laid on the other side of the center (wire) as in Fig. V, 1 and then folding the opposite strand, Fig. V, 2, making each square rotate ⅛ of a turn. Continue "square-round" for seven or eight times. Before drawing the last one tight, place the short "eye" strand in under the dark ends, then pull the long strands tight. Now make two more "square-rounds" and before pulling the last one tight thread the short strands back in under the long light strands and

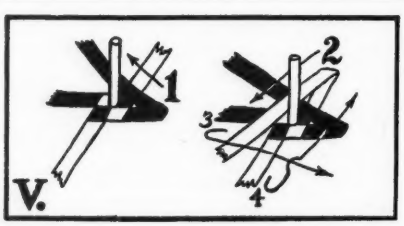
out the center of the square, then pull the long strands tight. This will complete the eyes. (Cut the wire off even if it still protrudes.)

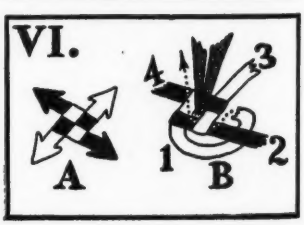
To complete with the final knot, which is a "turk's head" lock knot, make either a "square" or a "square-round," as the case may be, to make the ends *come out to the right*, as in Fig. VI, A. Now lay each strand under the next to the right and then over it, which will bring it out the center of the square. See Fig. VI, B. Number 1 "loops" No. 2, No. 2 loops No. 3, No. 3 loops No. 4, and then No. 4 will have to "find its way" under and over No. 1 which will now be laid flat in place. Pull these center ends *tight* one at a time or as a group. Cut these ends off short. Trim the two tongue strands with an angular cut at about one inch. Roll into a bracelet, or coil it into a life-like snake novelty.











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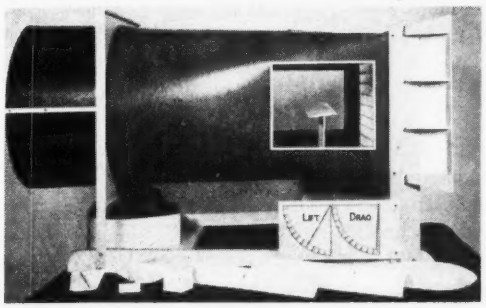

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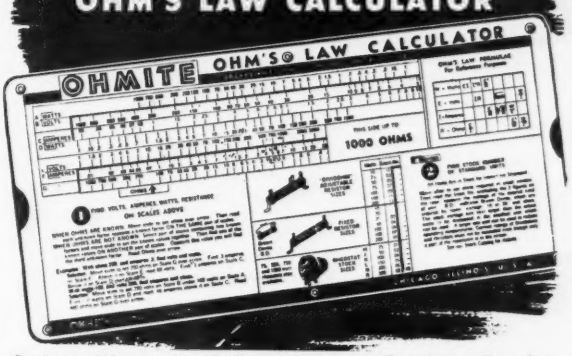

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What Do You Think?

How can the schools do a more effective job of training war workers for industry?

Says Henry D. Sharpe, President Brown and Sharpe Mfg. Co.:

It seems to me that the schools could do a more effective job of training war workers for our industry if they were to give their learners a real appreciation of the value of work, and a thorough understanding of the fact that besides learning the technics of a job, they must know, if they are to be successful, how to adjust themselves properly to their work conditions.

This means that they should know that management, foremen, and workmen, all must cooperate to the fullest extent in carrying out the war-production plans, and that their actions should indicate that they believe the goal to be the same for all.

Says Svend Pedersen, Director of Education, Lockheed Aircraft Corporation:

Aircraft plants follow the training-within-industry policy of training war workers in unit skills on the job. The school's job is a dual one: (1) job and trade preparatory, and (2) trade extension and supplementary training. Greater effectiveness can be gained by following a few basic principles:

1. Selection of courses of study to fit specific needs of the industry. This means collaboration through an advisory committee on the part of schools, management, and labor.

2. Selection of instructors with recent work experience in the industry.

3. Induct high-school seniors who are interested in and have aptitude for specific jobs into orientation training classes in subjects common to all plants in that industry—processes, materials, nomenclature, shop practices, safety regulations, etc.

4. Emphasize trade extension courses in regular vocational programs, giving related technical knowledge needed by indentured apprentices. Organize systematic curriculums of supplementary training giving related technical knowledge for present workers who want to improve on present jobs or want to prepare for advancement.

5. Use all training media including visual aids (sound-slide or movie films) that will emphasize a practical approach to shop practices.

6. Don't try to supplant on-the-job training in unit skills. Give opportunity for manipulative practice in basic skills common to all jobs in the specific industry.

7. Don't ignore so-called white-collar jobs and the related knowledge necessary therefore.

IN THE *Morning Mail*

● Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

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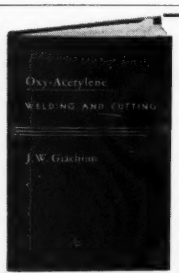

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A General Program

(Continued from Page 4)

secondary schools. The schools would provide realistic counsel to students based upon ascertained occupational opportunities and employment trends and related to the student's individual interests, aptitudes and limitations, both intellectual and economic.

Administrative Reorganization

The program of the senior secondary school thus outlined, including the junior college grades as an integral part of public secondary education, would mark for most youth the termination of their more formal organized educational experiences. These senior secondary schools should be strategically located in the larger communities of each state. They should be supported in part by federal, state and local funds; in part by tuition for nonresident students paid jointly by the student's home district and the state; and in part by miscellaneous student fees.

It is, of course, obvious that the first problem is one of administrative engineering. Larger areas of attendance, of administration and of school finance are necessary to bring together enough youth with similar vocational objectives to permit the offering of differentiated training and instruction on a group basis. It is significant that the defense training program, supported by federal funds, is giving impetus to this development inasmuch as local school district lines may be disregarded in enrolling older youth and adult trainees for defense training. Thus we find one or more new state-operated trade schools developing in Virginia, Arkansas, North Carolina, Nebraska and Kentucky, in addition to those already operating in Connecticut, New York, North Dakota and Alabama.

Finally, if education is to help youth meet their vocational objectives certain identifying characteristics of good vocational preparatory education must be kept clearly in focus; namely: (1) Such education must be directed to the application of skills and related knowledges in practical doing situations. (2) These doing situations should be similar to or identical with those which typically are met in the occupation itself. (3) Other things being equal, versatility of occupational competence will depend on the emphasis put on an understanding of the theoretical principles underlying the chosen field of work and allied fields. (4) If it is to be effective, instruction and training must be by teachers who are competent workers in the occupational field as well as competent teachers.

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Washington Letter

by Ben Brodinsky

CAN the high schools go on doing business as usual, with only minor modifications in curriculum and organization?"

"Emphatically No!"

The question was asked by John W. Studebaker, U. S. Commissioner of Education, in the name of 500 educators who assembled in Washington for the National Institute on Education and the War. But the answer was given by officials of the Army, Navy, Air Forces, War Production Board, Manpower Commission, and Civil Service Commission.

For the first time in the recent history of education, the federal government stood face to face with educators and cited for them what is expected of schools and school teachers if the Nation is to survive.

Educators went away with many an assignment, given straight from the shoulder in the name of victory by those who are charged with winning victory for us.

But the assignments fell most heavily in their implications on one group—the Nation's industrial arts and vocational education teachers.

What the federal government wants from education, in brief, is a reserve of secondary school pupils who can handle tools, read maps and blueprints, who have respect for thoroughness and technical precision, and who will be qualified to enter advanced technical courses. One observer put it that the federal government now wants from secondary education what Germany has been giving its youth for a century and Russia for a generation.

● *The Army Air Forces*, through Brig. General Kuter, said that the 125,000 airplanes which will fill the world's air oceans in 1943 will require 1,400,000 young technicians. That number, he said, is almost half the total number of young men in senior high schools.

Naval aviation, through A. W. Radford, U. S. N., named shop and manual training as one element in a Victory Formula. The other elements, he said, were mathematics, physics, geography, and engineering courses.

The War Department's Services of Supply flung the greatest challenge to the Nation's vocational educators: Said Lieutenant General Somervell:

"On January 1, 1942, out of every 1,000 men inducted, your Army needed 15 who had training as radio operators. From February 1, 1942, through March 31, 1942, we were getting less than one man per 1,000. Actually out of every 300,000 men inducted, we needed 4,689 with training as radio operators. We were getting 135.

"Out of every 300,000 men inducted, your Army needed 4,372 telephone and telegraph linemen. We were getting 343. We needed 1,562 master mechanics. We were getting 14.

"In the field of automotive mechanics, out of every 300,000 men inducted, we were short 10,437. That means a shortage of 34,790 out of every 1,000,000 men. In an Army of 4,000,000 men, that's a shortage of 139,160 automotive mechanics."

Flash!

● An executive order has just been issued by the White House giving the War Manpower Commission control over the training of war workers in order to secure "the most effective mobilization and utilization of the national manpower." The training program has been taken from the U. S. Office of Education and will be administered by the Manpower Commission as also will be the visual aids program. Other agencies taken over by the Commission include the NYA, the Apprenticeship Training Service, and the Training Within Industry Service.

The Navy, the Manpower Commission (speaking for the large orders for trained workers coming in from industry), and the Civil Service Commission —all called on educators to prepare or "to condition" secondary and higher education students for technical service as rapidly as possible.

"Looks like the wrench and lathe are coming into their own," said one observer, milling on the campus of American University among the crowd of educators who assembled for the Institute from every state in the Union. "More than that," said another, "looks like the old wrench is getting a little glamour, too."

● Army officials are not merely talking about shortages of skilled workers. A new unit of the War Department is now at work preparing outlines for high-school shop courses to gear them more closely to Army needs. These outlines will soon go to the Government Printing Office and will become available to schools before the school year is many months old. Army technical manuals, already available at low cost from the Superintendent of Documents in Washington, will be geared in with these outline courses.

● Washington is now agreed that it will be a long war—at least five to six years, followed by an even longer armed peace. Therefore federal officials look on the 7,000,000 secondary school students as one of the greatest reservist armies in the Nation, and the school shop as its greatest training ground.

Don't be surprised, therefore, to hear announcement of a comprehensive plan to channel most of the secondary school students into courses which will prepare them for military and war production needs. One of the first steps to be taken may be a gigantic occupational counseling program—designed primarily to meet the needs of a Nation at war.

● Official confirmation has come through that the American Vocational Association Convention will be held in Toledo, December 2-5, as originally planned.

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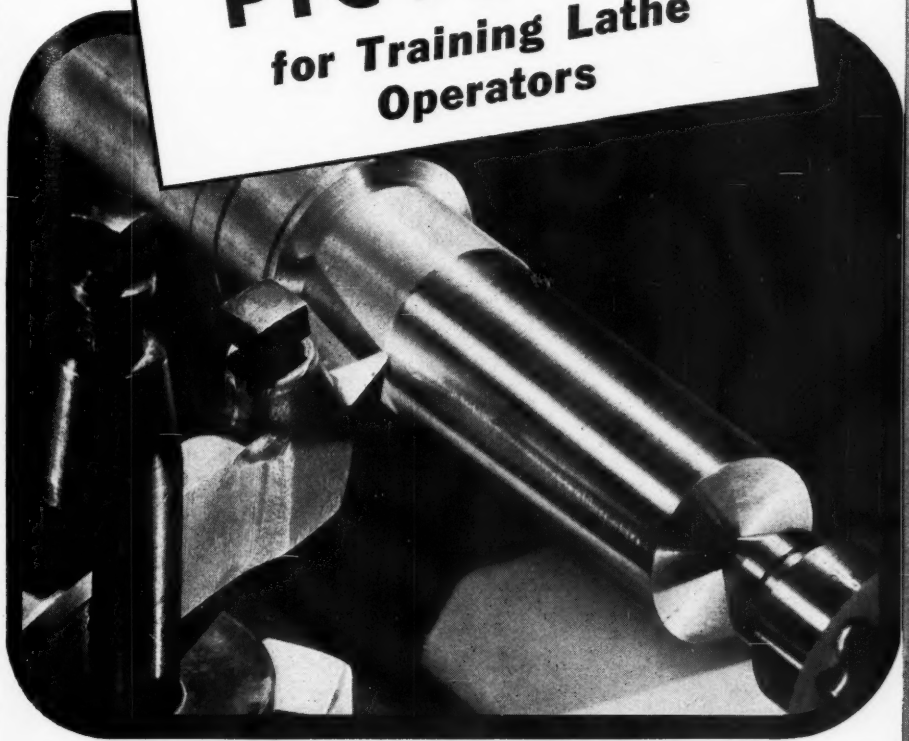

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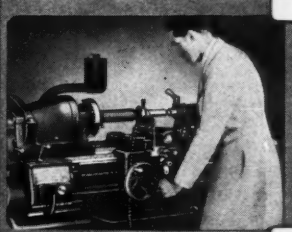

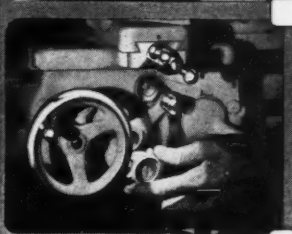

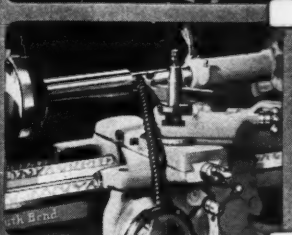

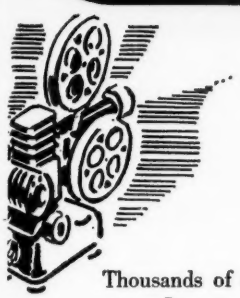

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